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HD **Enthusiasm for Glass Cockpits Not Universal**

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LP (AP) _ As United Airlines Flight 59 climbs through gray, rainy clouds, leaving the runway in the suburbs of Washington 1,000 feet below, Capt. John O'Keefe pushes a button and sweeps his hands away from the controls.

Like a boy showing his prowess with a favorite bicycle, O'Keefe seems to say with his gesture, ""Look, Ma. No hands."

TD The Boeing 767, bound for Los Angeles with 135 people aboard, is now under the control of its computers as it climbs through the clouds into bright sunshine and levels off at 39,000 feet, heading west. For the next five hours, right down to the landing at Los Angeles International Airport, the new generation jetliner will virtually fly itself and do it, say the plane's boosters, more efficiently than any human.

But the automation in the ""glass cockpits" _ a term coined because of the extensive use of video display terminals in jets like the Boeing 767, its sister 757 and the Airbus A310 _ also has spawned an intense controversy among pilots, manufacturers and aviation safety experts.

""Almost anything can be automated, but should it be?" asks Capt. Mel Hoagland, a United Airlines captain and chairman of a special task force studying cockpit automation for the Air Line Pilot's Association. ""How far out of the (decision making and operating) loop can we afford to let the pilot get?"

Aviation safety experts increasingly are asking how much flying should be left to the computers. And if the nod goes to the computer, what are the consequences to the flight crew? Will a pilot lose the ""fine edge" skills needed in an emergency when the computers fail?

""There are lots more of these kinds of questions. It is agreement on the answers that is in short supply," says Donald Engen, head of the Federal Aviation Administration.

These questions lingered as United Flight 59 pushed through the clear skies high above the fields and mountains below.

After turning the plane over to the computers, in which the plane's flight path already had been programmed, O'Keefe would not touch the steering wheel-like control yoke or the engine-regulating twin throttles again until the jetliner landed and rolled down the runway at Los Angeles five hours and a continent away. A number of flight adjustments were made during the trip, but usually well in advance through the computers which actually operated the aircraft right down to the landing.

Except for the landing gears, which must be raised and lowered manually, and the settings on the wing flaps, which could be set in advance, the computers could have flown Flight 59 across America without human intervention if the air traffic control system had accommodated the aircraft by clearing other traffic from its path.

""Much of what the airplane can do you can't do because we're constrained by the (air traffic control) system," says O'Keefe, a veteran United pilot and chief of its 767 pilot group. But he calls the Boeing 767, one of 19 owned by United, ""the most interesting and accommodating airplane I've ever flown."

The jetliner glistens with modern computer technology. A calculator-like device is used to program its flight path before takeoff, computers determine engine speed, altitude and direction of flight, other computers monitor the plane's overall operation.

On video monitors word about any of 278 possible on-board mechanical glitches can be provided to the pilot in color-coded messages: red for emergency alerts; amber for less serious advisories. Many of the problems are solved automatically, with the advisory informing the crew what had been done.

Once given its intended route, the onboard computers can direct the jetliner down a runway, lift it into the sky, level it off at a designated altitude, fly thousands of miles to its destination, calculate the most efficient descent, line the plane up with the airport, hook onto a ground signal that guides it down the middle of the runway, and even engage the brakes once landed.

O'Keefe and his co-pilot, David Stoddard, couldn't have more praise for the new generation jet. It's really several airplanes in one, the captain explains, because a pilot can decide whether to fly the plane conventionally with control over the plane's direction, altitude and speed; use all the available automatic systems, or ""somewhere in between.''

Enthusiasm is not universal.

Hoagland, who like O'Keefe is a veteran United pilot and has been flying a Boeing 767 for more than a year, complains its designers already may have gone too far in shifting the emphasis from pilot to computer. He says they ""used kind of a scatter gun effect...They automated everything.''

""Today we see engineers deliberately designing automatic systems that deny the crew critical information ...and access to control systems that are absolutely critical to the aircraft's survival,'' he says.

""For the most part aircraft designers not only do not design for pilots, but don't even particularly like pilots. The pilots complicate their job. It's a lot simpler to design a system that doesn't have human involvement.''

Aviation safety experts and aircraft manufacturers also have raised concern about the effects of cockpit automation on the pilot, who is rapidly evolving into a ""flight system manager'' or _ as one Boeing official said _ even a ""backup system'' to the computers.

And while some pilots are accepting the dramatic change, others find it hard to swallow.

""The rapid pace of automation is outstripping one's ability to comprehend all its implications for crew performance,'' says Earl L. Wiener, a University of Miami researcher who has written extensively on the potential pitfalls of aircraft automation.

While automation may bring many safety and economic benefits, he writes, there are signs that the computerized airplanes may create new problems that raise safety questions: pilots become bored, complacent, dissatisfied with the jobs, and less skilled.

""The potential for catastrophe...does exist,'' concedes Richard F. Gabriel, chief of human factors engineering at Douglas Aircraft Co. ""...This potential is recognized.'' But proper design ""can minimize or eliminate the difficulties.''

But aircraft manufacturers, especially those at Boeing Co., who have been in the forefront in developing highly **automated cockpits**, bristle at suggestions that the new jets are any less safe or that they are over-automated.

In fact, they argue, the aircraft are safer because they give the pilot more information, relieve him of scores of routine monitoring duties and allow him to see the broader picture during a flight.

""We didn't automatically automate everything,'' argues Richard Taylor, vice president for product development at Boeing Co., saying the new Boeing 767 is designed not to replace pilots but to simplify their job. ""The pilot is completely involved.''

And, he adds, a pilot can always elect not to use all the automation available and fly the plane manually.

Aviation safety experts and a number of pilots interviewed acknowledge that airlines that are flying the new, highly computerized jets have eased their pressure on flight crews for maximum use of the automated systems. United requires its 767 pilots to fly the aircraft manually at least some of the time to maintain their flying skills.

However, planes like the Boeing 767 or Boeing 757, which cost between $41 million and $68 million apiece, were designed for fullest use of the automated systems and were sold on the promise that the computers would cut fuel and labor costs.

Those benefits vanish when the highly automated plane is flown manually, airline officials agree.

""We don't want the pilot to fly,'' says Jack Martz, manager of Boeing's flight simulator where pilots are first exposed to the 767 or 757 cockpit. Instead, Martz says, the pilot should become a ""systems manager'' and monitor of the computer's operation of the aircrraft.

Government and industry sources point to accident statistics that show human errors are at least partially to blame in two out of three aircraft accidents.

Some of those errors, indeed, have defied explanation:

The crash of the Eastern Airlines jumbo jet into the Florida Everglades in 1972 as all three crew members were busy looking for the cause of a malfunctioning instrument light and forgot to keep an eye on their altitude; the 1978 crash landing of a United Airlines DC-8 at Portland, Ore., when it ran out of fuel because it circled the airport for an hour while the crew tried to solve a landing gear problem; or the belly landing last year of a Frontier Airlines Boeing 737 in Wyoming after the pilot and co-pilot forgot to put down the landing gears.

Since the ""glass cockpit'' was introduced to jetliners two years ago, none of the new generation planes has been involved in an accident traced to an automation problem.

That doesn't entirely reassure federal aviation safety investigators.

""The problem is that they (the automatic controls) work very well,'' says Kirk Gagnon, an investigator for the National Transportation Safety Board. ""People get used to them working well. On the rare occasion that they don't work, the crew's not prepared to take over. They're not used to seeing malfunctions and they're not quite ready to react.''

It was such a situation, according to investigators, that led to a near tragedy last February at New York's Kennedy International Airport when a Scandinavian Airlines jet overran the runway and skidded into the water. The crew and passengers escaped.

While not automated as extensively as the new generation jetliners, the Scandinavian Airlines DC-10's engines were controlled by an ""auto-throttle'' computer as it approached Kennedy.

Three miles out, a computer malfunction caused the engines to accelerate. When the plane touched down it was going too fast, landed too far down the runway and couldn't be stopped.

""The crew was not aware that the auto-throttle malfunctioned or what their air speed was,'' says Pat Kline, a Northwest Airlines pilot who participated in the NTSB investigation. He said the accident demonstrated ""a fundamental problem of automation'' in that even a veteran flight crew can be left unaware of a major problem during the most critical part of a flight.

A hidden danger in aircraft automation was spotlighted by the speculation over the downing of Korean Airlines Flight 007 by the Soviets a year ago. One theory was that the KAL flight crew might have put the wrong directions into the plane's computerized navigation system, causing it to fly over Soviet territory without the pilots noticing.

Anonymous flight incident reports from pilots to the National Aeronautics and Space Administration increasingly have involved concerns about cockpit automation, according to NASA officials. Here are a few:

_A pilot of a new generation jet reports computers nearly stalling his aircraft during an approach for a landing. The plane, with the computers directing a descent, is told by one computer to level off, but another computer continues reducing engine power as if the descent were continuing, causing a reduction in air speed. The pilot switches to manual control just as the plane is about to go into a stall, increases power and lands safely.

_On his approach to a busy airport, a pilot is given a sudden change in runways by air traffic control. The two-man crew is so busy reprogramming the computers through the keyboard that, according to one safety expert, they ""nearly flew into the ground.''

_A ""glass cockpit'' aircraft is climbing to 41,000 feet with the computers in control. At 35,000 feet the plane's airspeed has dropped to almost half of what it should be and continues to drop. The pilot disengages the automatic controls as the plane nears a stall. By increasing power manually he returns the plane to normal speed.

Had the air speed decline not been noticed, the consequences might have been much more serious. Aviation experts say the crew selected the wrong method of automatic climb _ one that guaranteed the loss of air speed after a certain altitude _ but they also criticize a design that allows such a selection without safeguards.

Such incidents suggest a clear lesson, says John K. Lauber, a NASA researcher and expert in aircraft automation and human behavior in the cockpit: ""New technology does not necessarily eliminate human error, and it can create many more opportunities for error.''

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